THE COTTON PLANT IN RELATION TO TEMPERATURE AND RAINFALL

By J. B. KINCER

The cotton plant is of tropical origin, but is now grown in many places between latitudes 40° N. and 30° S. In most forms it is a perennial shrub, but changes its habits of growth where cultivated in more northern regions. Cotton is slow growing and has a long fruiting season, and consequently requires at least six months free from frost; the weather should be warm, both day and night.

While cotton requires considerable moisture during the growing period, too much rainfall or cloudy weather is detrimental, especially during the harvest season. Successful cultivation is limited more by the prevailing temperature and the length of the growing season than by rainfall, as cotton is produced under widely varying moisture conditions.

In a recent publication, Bulletin No. 32 of the Ministry of Agriculture of Egypt, Mr. C. B. Williams presents two graphs, which bring out some interesting relations between climatic conditions and the growth of cotton. These are reproduced herewith. The countries and representative stations for which records are shown are as follows:

Egypt: Cairo.	Nigeria: Lagos.
Sudan: Tokar.	Texas: Abilene.
India: Madras.	Mesopotamia: Bagdad.
Turkestan: Tashkent.	

Figure 1 shows the relation between the temperature and the growth of cotton for the principal producing countries, the records being so adjusted as to bring the periods of planting, growth, and harvest and also of the closed season for the several countries in comparable positions on the chart. The first space shows temperature conditions, in mean monthly values, between the periods of growth; that is, when no cotton is on the land. The second space shows conditions from the time of planting to the beginning of harvest, the line to the left indicating the dates of planting and that to the right the beginning of harvest. The third space shows conditions during the picking season; and, finally, the last space is a reproduction of the first, or the rest period. The numerals indicate the respective months which are arranged to synchronize the successive epochs of growth.

With respect to temperature, cotton is grown under three general conditions:

(1) During the warm season of the year between two periods of low temperatures, such as in Egypt, the United States, Turkestan, Mesopotamia, and other countries. Here cotton is a summer crop.

(2) During the cool season, or between two periods of high temperature, such as in the Sudan and Madras, where it is a winter crop.

(3) Where the temperature is more or less constant throughout the year and is not the determining factor for the season of growth, such as Madeira, Brazil, and the Hawaiian Islands.

Where cotton is a summer crop it is planted on a rising temperature, Figure 1 showing that this usually varies from about 50° to 65°. Where it is a winter crop, planting is accomplished with considerably higher, but falling temperatures, ranging mostly between 75° and 85°. In nearly all cases, however, the temperature conditions become rather uniform soon after the beginning of growth, the mean daily value ranging between 75° and 80°, as a rule. At the beginning of picking the temperatures again diverge and they differ widely by the time harvest is completed. Mesopotamia varies considerably from the other countries shown on the diagram in that temperatures are considerably higher during the latter part of the period of growth. This usually necessitates heavy watering.

Figure 2 shows, in the same manner as Figure 1, the rainfall conditions in the several countries. This chart clearly shows why in Nigeria cotton is grown during the latter half of the calendar year, notwithstanding that temperatures are favorable throughout the year. The rainfall is entirely too heavy during the other months. The outstanding characteristic of this chart is the constantly and uniformly small amounts of rainfall during the picking season, which is a necessary condition for success in cotton growing.

There is also included on Figure 2 the amount of irrigation water used under normal rainfall in Egypt. It will be seen that considerably more water is given by irrigation during the latter part of the period of development than occurs naturally in nonirrigated countries. This is due to the fact that more water is required when artificially applied under dry atmospheric conditions and constant sunshine than when naturally precipitated. The latter is necessarily accompanied by cloudy skies and higher humidity which favor low evaporation and, consequently, less water is lost. It is stated that in Mesopotamia 13 successive waterings are given and that the total amount usually applied to the cotton crop annually is about 52 inches. This unusually heavy watering is made necessary by the prevailing high temperatures and sunshiny weather.

In the case of India, it will be noted that the rainfall values during the growth period are materially different from those in other cases. This is due largely to a rather unfortunate selection of meteorological records, for the city of Madras does not well represent the larger cotton-producing section of that country. While the highest grade of cotton is grown in the southern part of the Province of Madras, much the greater portion of it comes from the west-central Provinces of India, from the Nerbudda and Tapti Valleys, or from the Bombay presidency, Baroda and Berar. In these sections rainfall differs materially from that on the coast of Madras, which is represented in the graph by the records of the city of that name. In these central-western Provinces rainfall is much lighter, the annual amounts being usually about 30 to 35 inches, with the rainy season beginning in June and ending in October. Again in the southern inland portion of the cotton-producing section of Madras, the rainfall is also considerably lighter than on the coast, the October amounts averaging around 8 inches and the November 6 to 7 inches, or little more than one-half as heavy as that shown on the graph.

With respect to the United States, the precipitation shown represents the amount occurring in the extreme western portion of the cotton-growing area (Abilene, Tex.), and this again does not well represent moisture conditions in much the greater portion of the American Cotton Belt. In the central and eastern cotton-growing districts precipitation is much heavier, but at the same time the seasonal distribution holds very well. That is, there is usually less rainfall during the picking season than during the period of active growth.

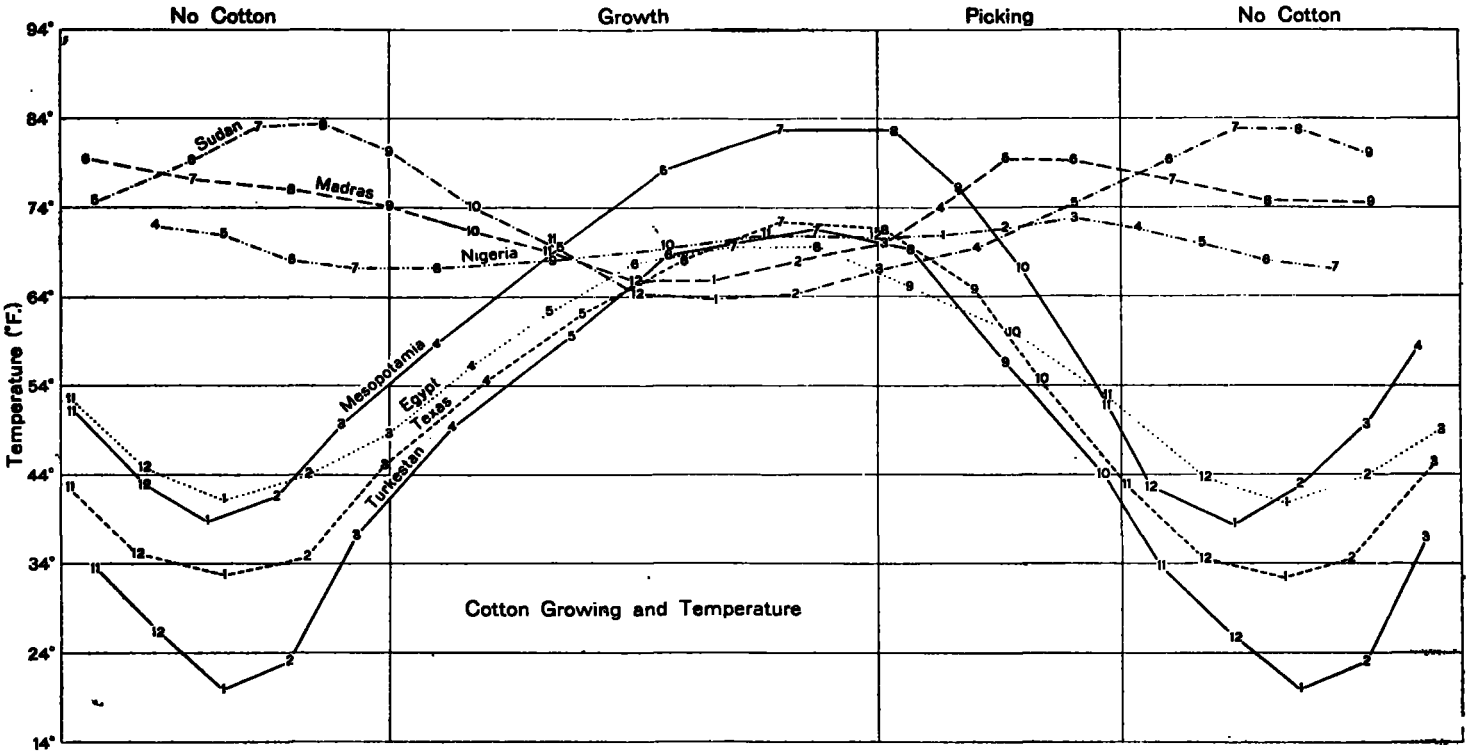
No Cotton
Growth
Picking
No Cotton
94°
84°
74°
64°
54°
44°
34°
24°
14°
Temperature (°F.)
Sudan
Madras
Nigeria
Mesopotamia
Egypt
Texas
Turkestan
Cotton Growing and Temperature

FIG. 1

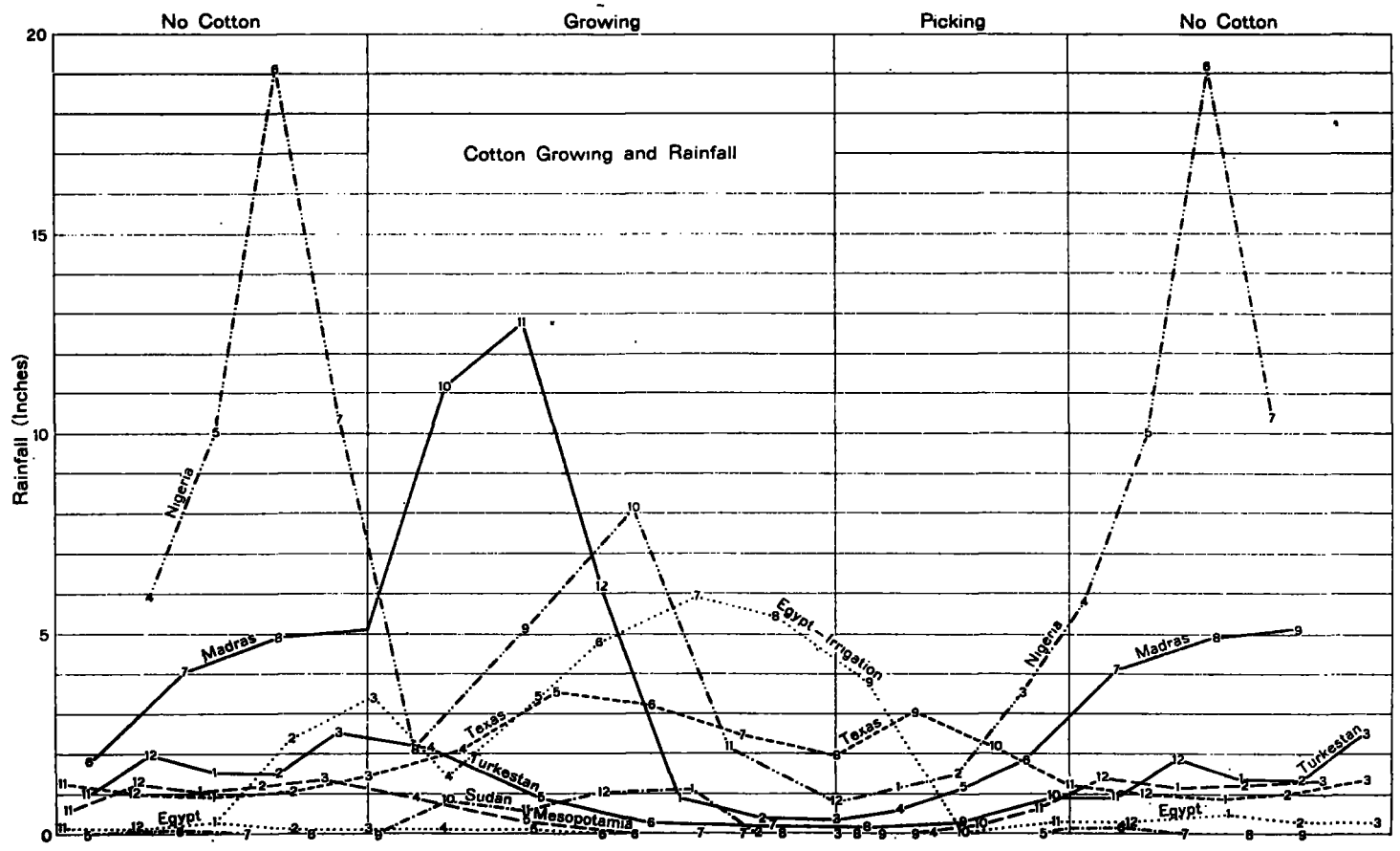
No Cotton
Growing
Picking
No Cotton
20
15
10
5
0
Rainfall (Inches)
Cotton Growing and Rainfall
Nigeria
Madras
Egypt - Irrigation
Texas
Turkestan
Sudan
Mesopotamia
Egypt

FIG. 2